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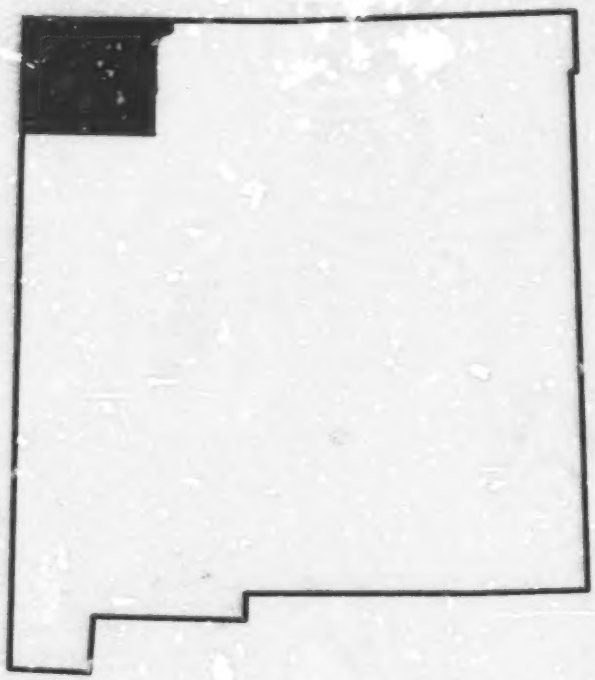
FLOOD INSURANCE STUDY



CITY OF AZTEC, NEW MEXICO
SAN JUAN COUNTY

JULY 15, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 350065

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
CITY OF AZTEC, SAN JUAN COUNTY, NEW MEXICO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Aztec, San Juan County, New Mexico, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823. This work was completed in March 1987.

1.3 Coordination

On August 10, 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives from FEMA, the city, and the USGS (the study contractor) to determine the streams to be studied by detailed methods.

On August 28, 1987, a final CCO meeting was held with representatives from FEMA, the city, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Aztec, San Juan County, New Mexico. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: the Animas River, from the downstream corporate limits to approximately 6,000 feet upstream; and Hampton Arroyo, from approximately 750 feet above the confluence with the Animas River to the upstream corporate limits. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through March 1992.

The remaining portions of the Animas River and an unnamed tributary were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the City of Aztec.

2.2 Community Description

The City of Aztec is located in the northeastern portion of San Juan County in northwestern New Mexico. It is completely surrounded by the unincorporated areas of San Juan County.

2.3 Principal Flood Problems

Aztec flooding problems are limited to occasional overflow of the Animas River. Hampton Arroyo, study reach 10, is contained within the main channel. The magnitude of the estimated 100-year flood for tributary inflows was considered negligible to the main stream magnitudes.

Study reaches in Aztec were limited to the Animas River, which extended one bridge width above U. S. Route 550 and Hampton Arroyo, which also was within the corporate limits.

Local residents were asked to provide any information pertaining to historical flood elevations to the local newspaper. Information of any extreme high-water elevations was not recovered from any local residents.

2.4 Flood Protection Measures

The Animas River and Hampton Arroyo have no flood protection measures.

VICINITY MAP

APPROXIMATE SCALE
2000 0 2000 4000 6000 FEET

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF AZTEC, NM
(SAN JUAN CO.)

FIGURE 1

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3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The 100-year peak discharge for the Animas River (study reach 9) was obtained from the flood-frequency curve using the period of record starting at the corporate limits of Farmington approximately 5 miles upstream from the Animas River at Farmington stream-flow gaging station No. 09364500 (Reference 1).

Regional equations developed for estimating peak flows for the 100-year flood on unregulated streams was used for Hampton Arroyo (reach 10) (Reference 1).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
ANIMAS RIVER		
At reach 9 (gaging station No. 09364500)*	1,090	18,700
HAMPTON ARROYO		
At reach 10 (regional)	4.09	1,840

*Information extends beyond the corporate limits

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Backwater analysis for the Animas River from Aztec to Farmington (reach 9) utilized 20 cross sections, approach and contracted sections for 3 bridges, and 18 synthesized cross sections. Backwater analysis for Hampton Arroyo through Aztec (reach 10) utilized 4 cross sections, approach and control sections for 3 bridges, and 3 synthesized cross sections. Bridge geometry and elevations were obtained from field survey. Synthesized cross sections were estimated from adjacent surveyed cross sections and topographic maps (Reference 2). The approach cross section was used for the exit section of each bridge and was assumed to be representative.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations of floods of the selected recurrence intervals were computed using the USGS WSPRO step-backwater computer program (Reference 3). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The starting water-surface elevations for the streams studied by detailed methods were determined by synthesizing cross sections downstream from section 1 and the valley slope. Four to 5 profiles with varied approximate starting elevations were used to determine convergence of M1 and M2 curve types. Normal depth was found or critical depth was found on steep slopes with section 1 contracted.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen from field observations of the cross sections, with reference to guidelines for roughness coefficients (Reference 4). The channel "n" values for the Animas River (reach 9) ranged from 0.034 to 0.035, and the overbank "n" values ranged from 0.033 to 0.042. Channel "n" values for Hampton Arroyo (reach 10) ranged from 0.028 to 0.042, and the overbank "n" values ranged from 0.028 to 0.042.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 2).

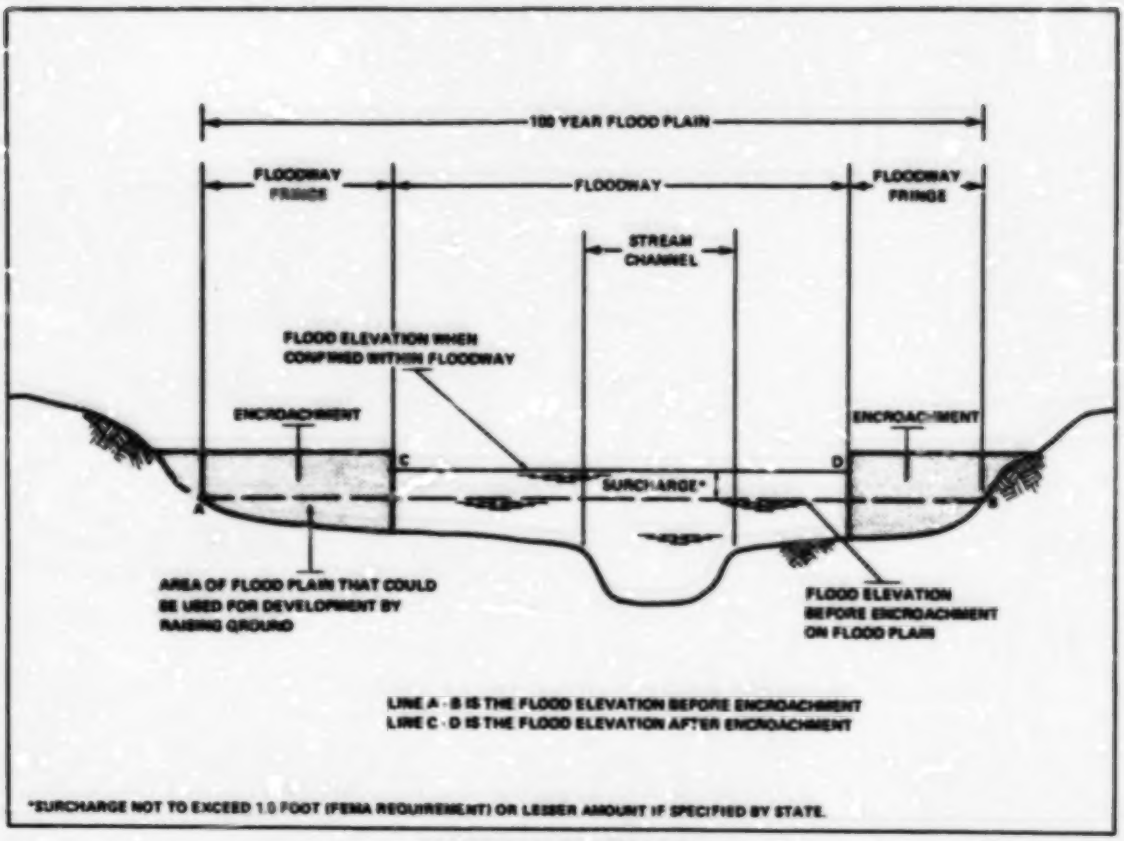
For the streams studied by approximate methods, the 100-year flood boundaries were delineated using the Flood Hazard Boundary Map for the City of Aztec (Reference 5).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2 .


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

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Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain,and to areas of 100-year flooding where average depths are less than 1 foot, areas of 10-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study for the unincorporated areas of San Juan County is currently being prepared (Reference 6). The results of that study will be in agreement with the results of this study.

Due to its more detailed nature, this study supersedes the Flood Hazard Boundary Map for the City of Aztec (Reference 5).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201.

9.0 BIBLIOGRAPHY AND REFERENCES

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2. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Aztec, New Mexico, 1981, Provisional Edition 1985; Flora Vista, New Mexico, 1963, Photorevised 1979.

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4. U. S. Department of the Interior, Geological Survey, Water Resources Investigation, General Field and Office Procedures for Indirect Discharge Measurements by M. A. Benson, and Tate Dalrymple, Washington, D. C., 1967.

5. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Aztec, San Juan County, New Mexico, May 7, 1976.

6. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of San Juan County, New Mexico (Unpublished).

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	15,685.012	Standard brass cap located approximately 0.9 mile northeast of Aztec corporate limits on U. S. Route 550 near old railroad grade east of highway.

LIMIT OF FLOODING AFFECTING COMMUNITY

CORPORATE LIMITS

CHACO STREET

U.S. ROUTE 550

LIMIT OF DETAILED STUDY

ELEVATION IN FEET (NGVD)

5600
5590
5580
5570
5560
5550

45 46 47 48 49 50 51 52

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE FARMINGTON CORPORATE LIMITS

A B C D

100 YEAR FLOOD

STREAM BED

CROSS SECTIONS LOCATION

FLOOD PROFILES

ANIMAS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF AZTEC, NM

(SAN JUAN CO.)

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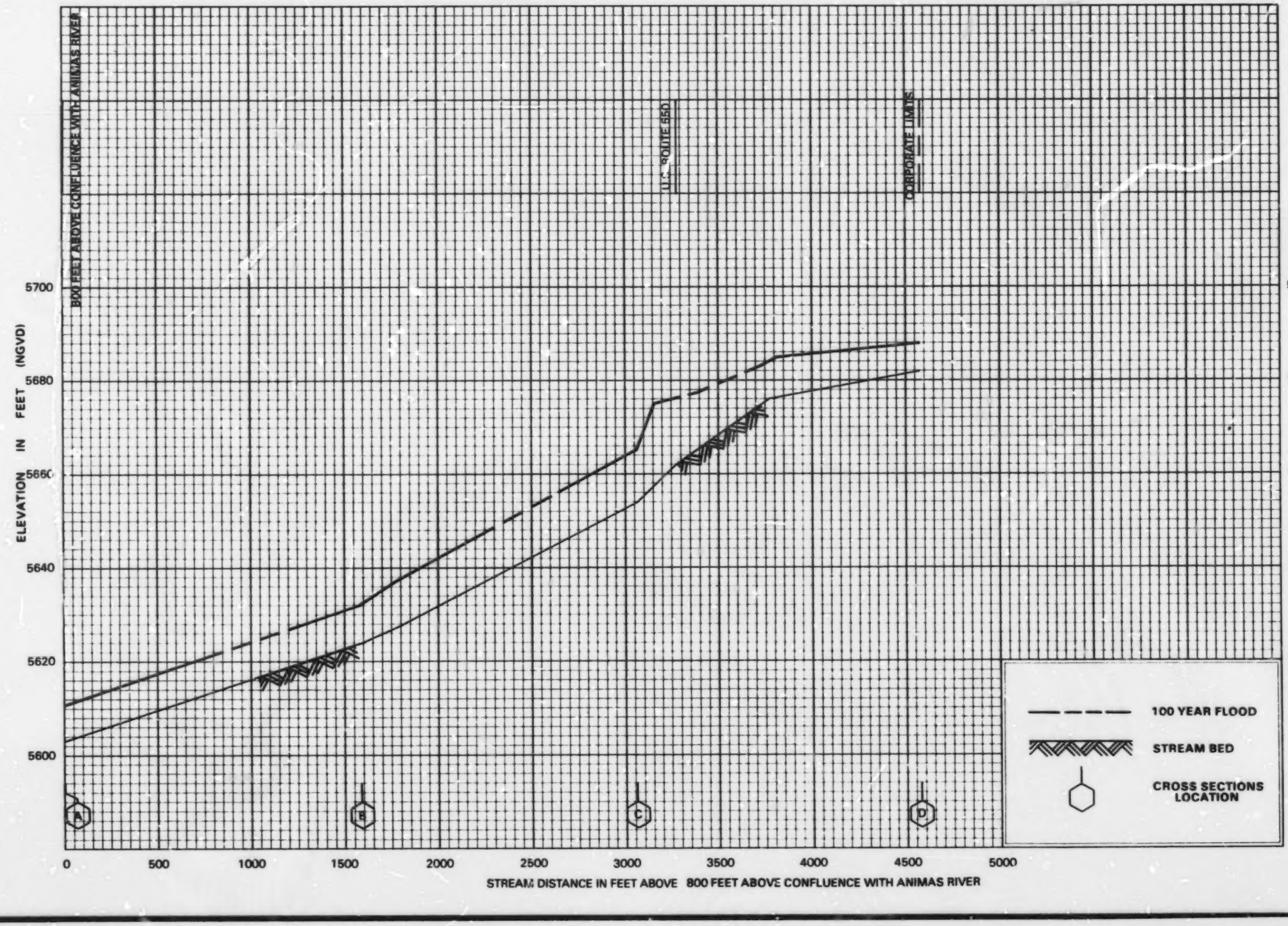

FLOOD PROFILES

HAMPTON ARROYO

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF AZTEC, NM
(SAN JUAN CO.)

02P

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